PROBLEMS.

281. By *Prof. Elias Schneider, Milton, Pa.* — Suppose the Earth to be a smooth sphere 25000 miles in circumference, and suppose a spherical ball, 5 miles in diameter, its mass being to that of the earth in proportion to the cubes of their diameters, to rest at a point A, on the earth's surface; and suppose further that the only influence acting on the ball and the earth is their mutual attraction, and that while the ball remains stationary upon the earth's surface at A, the earth rotates on its axis once in 24 hours.

Suppose now that the attraction of the sun acts upon the ball in the direction of the diameter AE, the earth having no other motion than rotation on its axis; when, from the rotation of the earth, the diameter AE ceases to point toward the sun, the ball will cease to be in equilibrium, and will roll over the earth's surface toward E. Required the relative velocity of the ball on the surface of the earth and the distance it will have advanced from the point A, when the point A shall have moved over 180°.

282. By *George Eastwood, Saxonville, Mass.*— Suppose a manufacturer of textile fabrics, who can operate sixty looms, ascertains by trial, (1) that when he makes his weavers sure of a dollar a day with constant work, then each loom, when it runs a whole day, will net three dollars; (2) that, from the nature of the work to be done, all the looms are never in running order at the same time; (3) that at any time it is equally possible that one, two, or three, or any number of them may be standing for repairs. Now, under these conditions, it is required to assign the least number of weavers to be placed under permanent pay, so that the average daily profits may be the greatest possible.

283. (Selected) By *Prof. Asaph Hall.*— If from any point in the plane of a parallelogram perpendiculars are let fall on the diagonal and on the two sides that contain this diagonal, the product of the diagonal by its perpendicular is equal to the sum of the products of the sides by their respective perpendiculars if the point falls outside of the parallelogram, or to their difference if it lies within the parallelogram.

Varignon's Theorem: Mecanique Analytique, Tome I, p. 13.

284. By *Prof. E. B. Seitz, Kirksville, Mo.*— M, N and P, Q are two pairs of random points within a circle, but on opposite sides of a given diameter AB: find the chance that the sum of the squares of the chords thro. M, P and N, Q is less than the square of the diameter.

285. By *W. E. Heal, Wheeling, Ind.* — If $E(e, x)$ denote the length of an elliptic arc, semi major axis unity and eccentricity e; prove, without the aid of the Integral Calculus, that

$$d\,E(e, x) = dx\sqrt{\left(\frac{1 - e^2x^2}{1 - x^2}\right)}.$$

286. By *Geo. M. Day, Lockport, N. Y.* — Three points are taken at random in a given circle, and a circle is drawn through them. What is the probability that the circle through the random points will be wholly in the given circle.

287. By *G. H. Harvill, Bonner, La.*—A ladder, 40 feet long, stands upright against a vertical wall, on a horizontal plane. A boy ascends the ladder, at a uniform rate, and at the same time the foot of the ladder slides out horizontally at the same uniform rate. How long is the boy's path?

288. By *Prof. E. J. Edmunds, New Orleans, La.*—Two circles are tangent to a given line AB; from a point C, on the line AB the other tang'ts, to the two circles, CM and CN, are drawn. Find the envelop of MN, and the locus of its middle point.

Query. By *Chas. H. Kummell, Assist. U. S. Lake Survey, Detroit, Mich.* —Prove, otherwise than by induction, that

$$2^{n-1} = \sum_0^{n-1}\left\{\frac{n+m-1}{1}\cdot\frac{n+m-2}{2}\cdots\frac{n}{m}\left(\frac{1}{2}\right)^m\right\}$$

if m n are positive integers, and give, if possible a value for

$$\sum_0^{n-1}\left\{\frac{n+m-1}{1}\cdot\frac{n+m-2}{2}\cdots\frac{n}{m}x^m\right\}$$

which reduces to 2^{n-1} for $x = \frac{1}{2}$.

ANNOUNCEMENT OF VOL. VII.—With this No. is completed the sixth annual volume of the ANALYST. And, though we have not been able to make any great improvement in its mechanical execution, we trust that, in respect to the subject-matter presented in its pages, it has not deteriorated in the late volumes, but that, on the other hand, it has steadily improved; and we feel flattered that many of our ablest contributors have expressed a desire that the publication may be continued. We take pleasure, therefore, in announcing that we have made definite arrangement for the publication of Vol. VII; and, if our health permits, we hope, and expect, to be able to publish other additional volumes.